



# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

## NATIONAL EXPOSURE RESEARCH LABORATORY

HUMAN EXPOSURE & ATMOSPHERIC SCIENCES DIVISION (MD-46)

Research Triangle Park, NC 27711

919-541-3737

Office of  
Research and Development

## LIST OF DESIGNATED REFERENCE AND EQUIVALENT METHODS

**Issue Date: July 10, 2001**

([www.epa.gov/ttn/amtic/criteria.html](http://www.epa.gov/ttn/amtic/criteria.html))

These methods for measuring ambient concentrations of specified air pollutants have been designated as "reference methods" or "equivalent methods" in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53). Subject to any limitations (e.g., operating range or temperature range) specified in the applicable designation, each method is acceptable for use in state or local air quality surveillance systems under 40 CFR Part 58 unless the applicable designation is subsequently canceled. Automated methods for pollutants other than PM<sub>10</sub> are acceptable for use only at shelter temperatures between 20°C and 30°C and line voltages between 105 and 125 volts unless wider limits are specified in the method description.

Prospective users of the methods listed should note (1) that each method must be used in strict accordance with its associated operation or instruction manual and with applicable quality assurance procedures, and (2) that modification of a method by its vendor or user may cause the pertinent designation to be inapplicable to the method as modified. (See Section 2.8 of Appendix C, 40 CFR Part 58 for approval of modifications to any of these methods by users.)

Further information concerning particular designations may be found in the *Federal Register* notice cited for each method or by writing to the National Exposure Research Laboratory, Human Exposure and Atmospheric Sciences Division (MD-46), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Technical information concerning the methods should be obtained by contacting the source listed for each method. Source addresses are listed at the end of the listing of methods, except for the addresses for lead method sources, which are given with the method. New analyzers or PM<sub>10</sub> samplers sold as reference or equivalent methods must carry a label or sticker identifying them as designated methods. For analyzers or PM<sub>10</sub> samplers sold prior to the designation of a method with the same or similar model number, the model number does not necessarily identify an analyzer or sampler as a designated method. Consult the manufacturer or seller to determine if a previously sold analyzer or sampler can be considered a designated method or if it can be upgraded to designation status. Analyzer users who experience operational or other difficulties with a designated analyzer or sampler and are unable to resolve the problem directly with the instrument manufacturer may contact EPA (preferably in writing) at the above address for assistance.

This list will be revised as necessary to reflect any new designations or any cancellation of a designation currently in effect. The most current revision of the list will be available for inspection at EPA's Regional Offices, and copies may be obtained by writing to the National Exposure Research Laboratory at the address specified above.

### **Most Recent Designations**

Environment S.A SANOA Longpath Monitoring System (O <sub>3</sub> SO <sub>2</sub> NO <sub>2</sub> )	May 8, 2000
TNRCC Inductively Coupled Plasma-AE Spectrometry Method for lead	May 8, 2000
URG Corp. Model URG-MASS100 Single PM2.5 FRM Sampler	May 8, 2000
URG Corp. Model URG-MASS300 Sequential PM2.5 FRM Sampler	May 8, 2000

NITROGEN DIOXIDE
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**Sodium Arsenite Method for NO<sub>2</sub>***Manual Equivalent Method: EQN-1277-026*

"Sodium Arsenite Method for the Determination of Nitrogen Dioxide in the Atmosphere."

*[Federal Register: Vol. 42, page 62971, 12/14/77]***Sodium Arsenite Method for NO<sub>2</sub> - Technicon II***Manual Equivalent Method: EQN-1277-027*

"Sodium Arsenite Method for the Determination of Nitrogen Dioxide in the Atmosphere-Technicon II Automated Analysis System."

*[Federal Register: Vol. 42, page 62971, 12/14/77]***TGS-ANSA Method for NO<sub>2</sub>***Manual Equivalent Method: EQN-1277-028*

"TGS-ANSA Method for the Determination of Nitrogen Dioxide in the Atmosphere."

*[Federal Register: Vol. 42, page 62971, 12/14/77]***Advanced Pollution Instrumentation, Inc. Model 200 NO<sub>2</sub> Analyzer***Automated Reference Method: RFNA-0691-082*

"Advanced Pollution Instrumentation, Inc. Model 200 Nitrogen Oxides Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with a 5-micron TFE filter element installed in the rear-panel filter assembly, with either a user- or vendor-supplied vacuum pump capable of providing 5 inches mercury absolute pressure at 5 slpm, with either a user- or vendor-supplied dry air source capable of providing air at a dew point of 0°C or lower, with the following settings of the adjustable setup variables:

Adaptive Filter = On

PMT Temperature Set Point = 15°C

Normal Filter Size = 12 samples

Dwell Time = 7 seconds

Rate of Change(ROC) Threshold = 10%

Dynamic Span = Off

Sample Time = 8 seconds

Reaction Cell Temperature = 50°C

Dynamic Zero = Off

and with or without any of the following options:

180 Stainless Steel Valves

283 Internal Zero/Span With Valves (IZS)

356 Level One Spares Kit

184 Pump Pack

325 RS-232/Status Output

357 Level Two Spares Kit

280 Rack Mount With Slides

355 Expendables

PE5 Permeation Tube for IZS

*[Federal Register: Vol. 56, page 27014, 06/12/91]***Advanced Pollution Instrumentation, Inc. Models 200A/200AU or****Teledyne Analytical Instruments Model 9110A NO<sub>2</sub> Analyzers***Automated Reference Method: RFNA-1194-099*

"Advanced Pollution Instrumentation, Inc. Models 200A and 200AU or Teledyne Analytical Instruments Model 9110A Nitrogen Oxides Analyzers," operated on any full scale range between 0-0.05 ppm and 0-1.0 ppm, with either a 1 or 5-micron TFE filter element installed in the filter assembly, with the following software settings: Dynamic Zero: OFF or ON; Dynamic Span: OFF; Cal-on-NO<sub>2</sub>: OFF; Dilution Factor: 1.0; AutoCal: ON or OFF; Independent Range: ON or OFF; AutoRange: ON or OFF; Temp/Pres Compensation: ON; and with or without any of the following options: Rack Mount with Slides, Rack Mount without Slides, Ears Only, Rack Mount for External Pump without Slide Tray, Stainless Steel Zero/Span Valves, 4-20 mA Isolated Outputs, Digital Status Outputs, or RS-232 Outputs. **Model 200A only:** operated at any temperature in the range of 5 °C to 40 °C, with either a user- or vendor-supplied vacuum pump capable of providing an absolute pressure no greater than 10 inches mercury at 1 slpm, Software setting Cal-on-NO<sub>2</sub>: OFF, with or without optional Internal Zero/Span with Valves (IZS) and Permeation Tubes for IZS, gold-plated reaction chamber, or sample conditioner. **Model 200AU only:** operated at any temperature in the range of 20 °C to 30 °C, with either a user- or vendor-supplied vacuum pump capable of providing an absolute pressure no greater than 4 inches mercury at 1 slpm.

*[Federal Register: Vol. 59, page 61892, 12/02/94]***Beckman Model 952-A NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer***Automated Reference Method: RFNA-0179-034*

"Beckman Model 952-A NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer," operated on the 0-0.5 ppm range with the 5-micron Teflon sample filter (Beckman P/N 861072 supplied with the analyzer) installed on the sample inlet line, with or without the Remote Operation Option (Beckman No. 635539).

*[Federal Register: Vol. 44, page 7806, 02/07/79]***Bendix Model 8101-B Oxides of Nitrogen Analyzer***Automated Reference Method: RFNA-0479-038*

"Bendix Model 8101-B Oxides of Nitrogen Analyzer," operated on a 0-0.5 ppm range with a Teflon sample filter installed on the sample inlet line and with the following post-manufacture modifications: 1) Ozone generator and reaction chamber input-output tubing modification per Bendix Service Bulletin 8101B-2; 2) The approved converter material; 3) The revised and EPA-approved operation and service manual. These items are mandatory and must be obtained from ABB Process Analytics. The analyzer may be operated with or without any of the following optional modifications: a. Perma Pure dryer/ambient air modification; b. Valve cycle time modification; c. Zero potentiometer centering modification per Bendix Service Bulletin 8101B-1; d. Reaction chamber vacuum gauge modification.

*[Federal Register: Vol. 44, page 26792, 05/07/79]*

**Bendix/Combustion Engineering Model 8101-C Oxides of Nitrogen Analyzer***Automated Reference Method: RFNA-0777-022*

"Bendix or Combustion Engineering Model 8101-C Oxides of Nitrogen Analyzer," operated on a 0-0.5 ppm range with a Teflon sample filter (Bendix P/N 007163) installed on the sample inlet line.

[Federal Register: Vol. 42, page 37435, 07/21/77]

**Columbia Scientific Industries Models 1600 and 5600 Analyzers***Automated Reference Method: RFNA-0977-025*

"CSI Model 1600 Oxides of Nitrogen Analyzer," operated on a 0-0.5 ppm range with a Teflon sample filter (CSI P/N M951-8023) installed on the sample inlet line, with or without any of the following options:

951-0103 Rack Ears	951-0114 Recorder Output, 5 V
951-0104 Rack Mounting Kit (Ears & Slides)	951-0115 External Pump (115 V, 60 Hz)
951-0106 Current Output, 4-20 mA (Non-Insulated)	951-8072 Molybdenum Converter Assembly (Horizontal)
951-0108 Diagnostic Output Option	951-8074 Copper Converter Assembly (Horizontal)
951-0111 Recorder Output, 10 V	951-8079 Copper Converter Assembly (Vertical)
951-0112 Remote Zero/Span Sample Control	951-8085 Molybdenum Converter Assembly (Vertical)

NOTE: The vertical molybdenum converter assembly is standard on all new analyzers as of 1-1-87; however, use of any of the other converter assemblies is optional. Also, the above options reflect new CSI part numbers.

"CSI Model 5600 Oxides of Nitrogen Analyzer," operated on a 0-0.5 ppm range, with any signal integration time in the range of 20 to 99 seconds, with a Teflon sample filter (CSI P/N M951-8023) installed on the sample inlet line, and with or without any of the following options:

954-0121 Status Contacts	964-0126 Printer	954-0131 Rack Mounting Kit (ears and slides)
954-0122 Input Solenoids	954-8024 Cartridge Dryer	964-0012 Single Headed Pump - Gast
954-0125 Current Output, 4-20 mA		951-0115 Single Headed Pump - KNF

[Federal Register: Vol. 42, page 46574, 09/16/77]

**Dasibi Model 2108 Oxides of Nitrogen Analyzer***Automated Reference Method: RFNA-1192-089*

"Dasibi Model 2108 Oxides of Nitrogen Analyzer," operated on the 0-500 ppb range, with software revision 3.6 installed in the analyzer, with the auto thumbwheel switch and the diag thumbwheel switch settings at 0, with the following internal CPU dipswitch settings:

<u>switch</u>	<u>position</u>	<u>function</u>
1	open(down)	Recorder outputs are NO & NO <sub>2</sub>
5	open (down)	3 minute time constant
6	closed (up)	3 minute time constant;

with a 5-micron Teflon filter element installed in the filter holder, and with or without any of the following options:

Built-in Permeation Oven	Rack Mounting	Three-Channel Recorder Output
RS-232 Interface	4-20 mA Output	

[Federal Register: Vol. 57, page 55530, 11/25/92]

**DKK Corporation Model GLN-114E Nitrogen Oxides Analyzer***Automated Reference Method: RFNA-0798-121*

"DKK Corporation Model GLN-114E Nitrogen Oxides Analyzer," operated within a temperature range of 20 to 30 degrees C on any of the following measurement ranges: 0-0.050, 0-0.100, 0-0.200, 0-0.500, and 0-1.000 ppm.

[Federal Register: Vol. 63, page 41253, 08/03/98]

**Environnement S. A. Model AC31M NO Analyzer***Automated Reference Method: RFNA-0795-104*

"Environnement S. A. Model AC31M Chemiluminescent Nitrogen Oxide Analyzer," operated with a full scale range of 0 - 500 ppb, at any temperature in the range of 15°C to 35°C, with a 5-micron PTFE sample particulate filter, with the following software settings: Automatic response time ON; Minimum response time set to 60 seconds (RT ÷ 2); and with or without any of the following options:<sup>2</sup> Internal Permeation Oven; Connection for Silica Gel Dryer; RS232-422 interface; EV3 valve; Internal Printer.

[Federal Register: Vol. 60, page 38326, 07/26/95]

**Environnement S.A. SANOVA Multigas Longpath Monitoring System***Automated Reference Method: EQNA-0400-139*

"Environnement S.A. Model SANOVA Multigas Longpath Air Quality Monitoring System," consisting of a receiver, one or more projectors, interface unit, a user-provided control unit computer running the SANOVA VisionAIR software, and associated incidental equipment; configured for measuring NO<sub>2</sub>, with the temperature control and internal calibration cell options installed, operated with a measurement range of 0 to 0.5 ppm, over an installed monitoring path length of between 27 and 500 meters, within an ambient air temperature range of -30 to +45°C, with a measurement (integrating) time of 180 seconds, and with or without external temperature and barometric pressure sensors or any of the following options: external (meteo) input connection, series 1M bus connection, OGR type projector, analog outputs.

[Federal Register: Vol 65, page 26603, 05/08/00]

**Horiba Instruments Model APNA-360 NO-NO<sub>2</sub>-NO<sub>x</sub> Monitor***Automated Reference Method: RFNA-0196-111*

"Horiba Instruments, Inc. Model APNA-360 Ambient NO-NO<sub>2</sub>-NO<sub>x</sub> Monitor," operated with a full scale range of 0 - 0.50 or 0 - 1.0 ppm, at any temperature in the range of 10 °C to 40 °C, with a Line Setting of "MEASURE", and an Analog Output of "MOMENTARY VALUE", and with or without the following options:<sup>2</sup> 1) Rack Mounting Plate and Side Rails 2) RS-232 Communications Port.

[Federal Register: Vol. 61, page 11404, 03/20/96]

#### Meloy Model NA530R Nitrogen Oxides Analyzer

Automated Reference Method: **RFNA-1078-031**

"Meloy Model NA530R Nitrogen Oxides Analyzer," operated on the following ranges and time constant switch positions:

Range, ppm:	<u>0-0.1<sup>1</sup></u>	<u>0-0.25<sup>1</sup></u>	<u>0-0.5</u>	<u>0-1.0</u>
Time Constant Setting:	4	3 or 4	2,3, or 4	2,3, or 4

Operation of the analyzer requires an external vacuum pump, either Meloy Option N-10 or an equivalent pump capable of maintaining a vacuum of 200 torr (22 inches mercury vacuum) or better at the pump connection at the specified sample and ozone-air flow rates of 1200 and 200 cm<sup>3</sup>/min, respectively. The analyzer may be operated at temperatures between 10°C and 40°C and at line voltages between 105 and 130 volts, with or without any of the following options: N-1A Automatic Zero And Span; N-2 Vacuum Gauge; N-4 Digital Panel Meter; N-6 Remote Control For Zero And Span; N-6B Remote Zero/Span Control And Status (Pulse); N-6C Remote Zero/Span Control And Status (Timer); N-9 Manual Zero/Span; N-10 Vacuum Pump Assembly (See Alternate Requirement Above); N-11 Auto Ranging; N-14B Line Transmitter; N-18 Rack Mount Conversion; N-18A Rack Mount Conversion.

[Federal Register: Vol. 43, page 50733, 10/31/78 and Vol. 44, page 8327, 02/09/79]

#### Monitor Labs Model 8440E Nitrogen Oxides Analyzer

Automated Reference Method: **RFNA-0677-021**

"Monitor Labs Model 8440E Nitrogen Oxides Analyzer," operated on a 0-0.5 ppm range (position 2 of range switch) with a time constant setting of 20 seconds, with or without any of the following options:

TF- Sample Particulate Filter	DO- Status Outputs	018A- Ozone Dry Air	018B- Ozone Dry Air - No Drierite
With TFE Filter Element	R-Rack Mount	V- Zero/Span Valves	FM- Flow meters

[Federal Register: Vol. 42, page 37434, 07/21/77; Vol. 42, page 46575, 09/16/77; Vol. 46, page 29986, 06/04/81]

#### Monitor Labs/Lear Siegler Model 8840 Nitrogen Oxides Analyzer

Automated Reference Method: **RFNA-0280-042**

"Monitor Labs or Lear Siegler Model 8840 Nitrogen Oxides Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with an internal time constant setting of 60 seconds, a TFE sample filter installed on the sample inlet line, with or without any of the following options:

02 Flowmeter	08A Pump Pa c Assembly With 09A (115 VAC)	011A Recorder Output 1 Volt
03A Rack Ears	08B Pump Pac As sembly With 09B (100 VAC)	011B Recorder Output 100 mV
03B Slid es	08C Pump Pac Assembly With 09C (220/240 VAC)	011C Recorder Output 10 mV
05A Zer o/Span Valves	08D Rack Mount Panel Assembly	012A DAS Output 1 Volt
05B Valve/ Relay	09A Pump 115 VAC 50/60 Hz	012B DAS Output 100 mV
06 St atus	09B Pump 100 VAC 50/60 Hz	012C DAS Output 10 mV
07A Input Power Transformer 100 VAC, 50/60 Hz	09C Pump 220/240 VAC 50 Hz	013A Ozone Dry Air
07B Input Power Transformer 220/240 VAC 50 Hz		013B Ozone Dry Air - No Drierite

[Federal Register: Vol. 45, page 9100, 02/11/80 and Vol. 46, page 29986, 06/04/81]

#### Monitor Labs/Lear Siegler Model 8841 Nitrogen Oxides Analyzer

Automated Reference Method: **RFNA-0991-083**

"Monitor Labs or Lear Siegler Model 8841 Nitrogen Oxides Analyzer," operated on the 0-0.05 ppm<sup>1</sup>, 0-0.1 ppm<sup>1</sup>, 0-0.2 ppm<sup>1</sup>, 0 - 0.5 ppm, or 0-1.0 ppm range, with manufacturer-supplied vacuum pump or alternative user-supplied vacuum pump capable of providing 200 torr or better absolute vacuum while operating with the analyzer.

[Federal Register: Vol. 56, page 47473, 9/19/91]

#### Monitor Labs/Lear Siegler Models ML9841 or ML9841A,

Automated Reference Method: **RFNA-1292-090**

#### Monitor Labs Model ML9841B, or Wedding & Associates Model 1030 NO<sub>2</sub> Analyzers

"Lear Siegler Measurement Controls Corporation or Monitor Labs Models ML9841 or ML9841A, Monitor Labs Model ML9841B, or Wedding & Associates, Inc. Model 1030 Nitrogen Oxides Analyzers," operated on any full scale range between 0-0.05 ppm<sup>1</sup> and 0-1.0 ppm, at any temperature in the range of 15°C to 35°C, with the service switch on the secondary panel set to the *In* position; with the following menu choices selected: Range: *0.05 ppm* to *1.0 ppm*; Over-ranging: *Enabled* or *Disabled*; Calibration: *Manual* or *Timed*; Diagnostic Mode: *Operate*; Filter Type: *Kalman*; Pres/Temp/Flow Comp: *On*; Span Comp: *Disabled*; and as follows: **Models ML9841 and ML9841A** - with a five-micron Teflon® filter element installed internally, with the 50-pin I/O board installed on the rear panel configured at any of the following output range setting: Voltage, 0.1 V, 1 V, 5 V, 10 V; Current, 0-20 mA, 2-20 mA, 4-20 mA; and with or without any of the following options: Valve Assembly for External Zero/Span (EVS); Internal Zero/Span (IZS) Assembly for; Rack Mount Assembly; Internal Floppy Disk Drive. **Models ML9841B and 1030** - with a vendor-supplied or equivalent user-supplied five-micron Teflon® filter and exhaust pump, and with or without any of the following options: Valve Assembly for External Zero/Span (EVS); 50-pin I/O board; Internal Zero/Span (IZS) Assembly; Rack Mount Assembly; Charcoal exhaust scrubber; hinged, fold-down front panel.

[Federal Register: Vol. 57, page 60198, 12/18/92]

### Opsis Model AR 500 and System 300 Open Path Ambient Air Monitoring Systems for NO<sub>2</sub>

Automated Equivalent Method: EQNA-0495-102

"Opsis Model AR 500 System" or "System 300" Open Path (long path) Ambient Air Monitoring Systems, configured for measuring NO<sub>2</sub>, with one detector and movable grating, operated with a measurement range of 0 to 0.5 ppm, an installed monitoring path length between 50 and 500 meters (or 50 and 1000 meters with the ER 150 option, AR 500 System only), xenon lamp type B (150 watt), fiber optic cable length between 3 and 20 meters; operating within an ambient air temperature range of -50 to +50°C, an analyzer temperature range of 20 to 30°C, a measurement (integrating) time setting between 30 and 120 seconds (0 min:30 sec. to 2 min:00 sec.), and with a complete cycle time of not more than 200 seconds (3 min, 20 sec.). Under this method designation, the Model AR 500 System or System 300 consists of: AR 500 opto-analyzer; emitter EM 110 and receiver RE 110 (together identified as ER 110); optic fibre cable OF60-S; power supply PS 150; OPSIS operational software, version 7.0 or 7.1; and initial on-site installation, setup, and limited operator training.<sup>2</sup>

#### Optional components that can be used with the Model AR

**500 only**, in addition to or as alternative to corresponding components listed above:

AR 503 opto-analyzer configured as Model AR 500 (only the center detector active, sequential monitoring)

Emitter/receiver ER 150 (for monitoring path lengths up to 1 kilometer)

Transceiver ER 130 and Retroreflector RE 090 with:

7 prisms (max. monitoring path length 150 meters) or

12 prisms (max. monitoring path length 250 meters)

Receiver RE 130

Xenon lamp type A (higher short-wavelength UV output)

Optic fibre cable OF60-R (low-loss for short wavelengths)

Multiplexers MX 004 and MX 024

Dataloggers DL 010 and DL 016

Analogue and digital input/output cards AO 008, AI 016, and DI 032

Analogue and digital isolation cards IA 008, ID 008, OA 008, and OD 008,

Window heaters HF 110 and HF 150

Mirror heaters HM 110 and HM 150

Auto calibration unit CU 007

Software packages IO 80 (for the analogue and digital input/output adapters), DL10 and DL16 (for data loggers), ComVision, and STAT 500;

#### Recommended calibration and accuracy audit components (or equivalent) for either Model AR 500 or System 300:

Wavelength calibration lamp CA 004

Calibration bench CB 100

Receiver unit RE 060 (two required)

Calibration unit CA 150, with same type lamp as used in the monitoring path emitter

Power supply PS 150 for calibration unit CA 150

Calibration cells CC 001-X, where X represents various cell lengths from 1 to 900 mm

Filter GG 400

Special calibration cells CC 110 or CC 150 (for mounting directly on receiver)

Light meter LM 010.

[Federal Register: Vol. 60, page 21518, 05/02/95]

### Philips Model PW9762/02 NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer

Automated Reference Method: RFNA-0879-040

"Philips Model PW9762/02 NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer," consisting of the following components: PW9762/02 Basic Analyzer; PW9729/00 Converter Cartridge; PW9731/00 Sampler or PW9731/20 Dust Filter; operated on a range of 0-0.5 ppm, with or without any of the following accessories: PW9752/00 Air Sampler Manifold; PW9732/00 Sample Line Heater; PW9011/00 Remote Control Set.

[Federal Register: Vol. 44, page 51683, 09/04/79]

### Thermo Electron/Thermo Environmental Instruments Model 14 B/E

Automated Reference Method: RFNA-0179-035

"Thermo Electron or Thermo Environmental Instruments, Inc. Model 14 B/E Chemiluminescent NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer," operated on the 0-0.5 ppm range, with or without any of the following options:

14-001 Teflon Particulate Filter

14-003 Long-Time Signal Integrator

14-005 Sample Flowmeter

14-002 Voltage Divider Card

14-004 Indicating Temperature Controller

14-006 Air Filter

[Federal Register: Vol. 44, page 7805, 02/07/79 and Vol.44, page 54545, 09/20/79]

### Thermo Electron/Thermo Environmental Instruments Model 14 D/E

Automated Reference Method: RFNA-0279-037

"Thermo Electron or Thermo Environmental Instruments, Inc. Model 14 D/E Chemiluminescent NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer," operated on the 0-0.5 ppm range, with or without any of the following options: 14-001 Teflon Particulate Filter; 14-002 Voltage Divider Card.

[Federal Register: Vol. 44, page 10429, 02/20/79]

**Thermo Environmental Instruments Models 42, 42C NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer***Automated Reference Method: RFNA-1289-074*

"Thermo Environmental Instruments Inc. Model 42 or Model 42C NO-NO<sub>2</sub>-NO<sub>x</sub> Analyzer," operated on any measurement range between 0-50 ppb<sup>1</sup> and 0-1000 ppb, with any time average setting from 10 to 300 seconds, with temperature and/or pressure compensation on or off, operated at temperatures between 15 °C and 35 °C, with or without any of the following options: <sup>2</sup>

42-002 Rack mounts

42-006 Pressure transducer (Model 42 only)

42-003 Internal Zero/span and sample valves with remote activation

42-007 Ozone particulate filter

42-004 Sample/ozone flow meters (Model 42 only)

42-008 RS-232/485 interface

42-005 4-20 mA current output

42-009 Permeation dryer

*[Federal Register: Vol. 54, page 50820, 12/11/89]***NOTES**

<sup>1</sup> Users should be aware that designation of this analyzer for operation on ranges less than the range specified in the performance specifications for this analyzer (40 CFR 53, Subpart B) is based on meeting the same absolute performance specifications required for the specified range. Thus, designation of these lower ranges does not imply commensurably better performance than that obtained on the specified range.

<sup>2</sup> This analyzer is approved for use, with proper factory configuration, on either 50 or 60 Hertz line frequency and nominal power line voltages of 115 Vac and 220 Vac.

## Sources or Contacts for Designated Reference and Equivalent Methods

ABB Process Analytics  
P.O. Box 831  
Lewisburg, WV 24901  
(304) 647-4358

Advanced Pollution  
Instrumentation, Inc.  
6565 Nancy Ridge Drive  
San Diego, CA 92121-2251  
(619) 657-9800

Andersen Instruments  
500 Technology Court  
Smyrna, GA 30082-9211  
(800) 241-6898

ASARCO Incorporated  
3422 South 700 West  
Salt Lake City, UT 84119  
(801) 262-2459

Beckman Instruments, Inc.  
Process Instruments Division  
2500 Harbor Blvd.  
Fullerton, CA 92634  
(714) 871-4848

Bendix  
[Refer to ABB Process Analytics]

BGI Incorporated  
58 Guinan Street  
Waltham, MA 02154

Columbia Scientific Industries  
11950 Jollyville Road  
Austin, TX 78759  
(800) 531-5003

Combustion Engineering  
[Refer to ABB Process Analytics]

Dasibi Environmental Corp.  
506 Paula Avenue  
Glendale, CA 91201  
(818) 247-7601

DKK Corporation  
4-13-14 Kichijoji Kitamachi,  
Musashino-shi  
Tokyo, 180, Japan

Environnement S.A  
111, bd Robespierre  
78300 Poissy, France  
Instruments also available from:  
Altech/Environnement U.S.A.  
2623 Kaneville Court  
Geneva, IL 60134  
(630) 262-4400  
rbrown@altechusa.com

Envionics, Inc.  
69 Industrial Park Rd. E.  
Tolland, CT 06084-2805  
(203) 429-0077

Graseby GMW  
[Refer to Andersen Instruments]

Horiba Instruments Incorporated  
17671 Armstrong Avenue  
Irvine, CA 92714  
(800) 446-7422

Lear Siegler  
[Refer to Monitor Labs, Inc.]

Commonwealth of Massachusetts  
Department of Environmental  
Quality Engineering  
Tewksbury, MA 01876

Met One Instruments, Inc.  
1600 Washington Blvd.  
Grants Pass, OR 97526  
(541) 471-7111  
metone@metone.com

McMillan  
[Refer to Columbia Scientific Industries]

Mine Safety Appliances  
600 Penn Center Blvd.  
Pittsburgh, PA 15235-5810  
(412) 273-5101

Monitor Labs, Inc.  
74 Inverness Drive  
Englewood, CO 80112-5189  
(800) 422-1499

Opsis AB, Furulund, Sweden  
Instruments also available from:  
Opsis, Inc.  
146-148 Sound Beach Avenue  
Old Greenwich, CT 06870  
(203) 698-1810

State of Oregon  
Department of Environmental Quality  
Air Quality Division  
811 S.W. Sixth Avenue  
Portland, OR 97204

PCI Ozone Corp.  
One Fairfield Crescent  
West Caldwell, NJ 07006  
(201) 575-7052

Phillips Electronic Instruments, Inc.  
85 McKee Drive  
Mahwah, NJ 07430

Rupprecht & Patashnik Co., Inc.  
25 Corporate Circle  
Albany, NY 12203  
(518) 452-0065

Sibata Scientific Technology, Ltd.  
1-25, 3-chome  
Ikenohata, Taito-ku  
Tokyo 110, Japan  
81-3(3822)2272  
TTani@email.msn.com

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[Refer to Thermo Environmental  
Instruments, Inc.]

# U.S. EPA REFERENCE & EQUIVALENT METHODS FOR AMBIENT AIR

July 10, 2001

<u>Method</u>	<u>Designation Number</u>	<u>Method Code</u>	<u>Method</u>	<u>Designation Number</u>	<u>Method Code</u>
<b><u>SO<sub>2</sub> Manual Methods</u></b>			Dasibi 3003	RFCA-0381-051	051
Reference method (pararosaniline)	--	097	Dasibi 3008	RFCA-0488-067	067
Technicon I (pararosaniline)	EQS-0775-001	097	Environnement s.a. CO11M	RFCA-0995-108	108
Technicon II (pararosaniline)	EQS-0775-002	097	Horiba AQM-10, -11, -12	RFCA-1278-033	033
			Horiba 300E/300SE	RFCA-1180-048	048
			Horiba APMA-360	RFCA-0895-106	106
<b><u>SO<sub>2</sub> Analyzers</u></b>			Lear Siegler or Monitor Labs ML9830,		
Advanced Pollution Instr. 100	EQSA-0990-077	077	Monitor Labs ML9830B, Wedding 1020	RFCA-0992-088	088
Advanced Pollution Instr. 100A or			MASS - CO 1 (Massachusetts)	RFCA-1280-050	050
Teledyne Analytical Instruments 6400A	EQSA-0495-100	100	Monitor Labs 8310	RFCA-0979-041	041
Asarco 500	EQSA-0877-024	024	Monitor Labs or Lear Siegler 8830	RFCA-0388-066	066
Beckman 953	EQSA-0678-029	029	MSA 202S	RFCA-0177-018	018
Bendix 8303	EQSA-1078-030	030	Thermo Electron or Thermo		
Columbia Scientific Industries 5700	EQSA-0494-095	095	Environmental Instruments 48, 48C	RFCA-0981-054	054
Dasibi 4108	EQSA-1086-061	061			
DKK Corp. Model GFS-32	EQSA-0701-115	115	<b><u>NO<sub>x</sub> Manual Methods</u></b>		
DKK Corp. Model GFS-112E	EQSA-0100-133	133	Sodium arsenite (orifice)	EQN-1277-026	084
Environnement S.A. AF21M	EQSA-0292-084	084	Sodium arsenite/Technicon II	EQN-1277-027	084
Environnement S.A. SANO A	EQSA-0400-138	138	TGS-ANSA (orifice)	EQN-1277-028	098
Horiba Model APSA-360/APSA-360ACE	EQSA-0197-114	114			
Lear Siegler AM2020	EQSA-1280-049	049	<b><u>NO<sub>x</sub> Analyzers</u></b>		
Lear Siegler SM1000	EQSA-1275-005	005	Advanced Pollution Instr. 200	RFNA-0691-082	082
Lear Siegler or Monitor Labs ML9850,			Advanced Pollution Instr. 200A or		
Monitor Labs ML9850B, Wedding 1040	EQSA-0193-092	092	Teledyne Analytical Instruments 9110A	RFNA-1194-099	099
Meloy SA185-2A	EQSA-1275-006	006	Beckman 952A	RFNA-0179-034	034
Meloy SA285E	EQSA-1078-032	032	Bendix 8101-B	RFNA-0479-038	038
Meloy SA700	EQSA-0580-046	046	Bendix 8101-C	RFNA-0777-022	022
Monitor Labs 8450	EQSA-0876-013	513	Columbia Scientific Indust.1600, 5600	RFNA-0977-025	025
Monitor Labs or Lear Siegler 8850	EQSA-0779-039	039	Dasibi 2108	RFNA-1192-089	089
Monitor Labs or Lear Siegler 8850S	EQSA-0390-075	075	DKK Corp GLN-114E	RFNA-0798-121	121
Opsis AR 500, System 300 (open path)	EQSA-0495-101	101	Environnement S.A. AC31M	RFNA-0795-104	104
Philips PW9700	EQSA-0876-011	511	Environnement S.A. SANO A	EQNA-0400-139	139
Philips PW9755	EQSA-0676-010	010	Horiba APNA-360	RFNA-0196-111	111
Thermo Electron 43	EQSA-0276-009	009	Lear Siegler or Monitor Labs ML9841,		
Thermo Electron 43A or Thermo			ML9841A, Monitor Labs ML9841B,		
Environmental Instruments 43B, 43C	EQSA-0486-060	060	Wedding 1030	RFNA-1292-090	090
			Meloy NA530R	RFNA-1078-031	031
<b><u>O<sub>3</sub> Analyzers</u></b>			Monitor Labs 8440E	RFNA-0677-021	021
Advanced Pollution Instr. 400/400A	EQOA-0992-087	087	Monitor Labs or Lear Siegler 8840	RFNA-0280-042	042
Beckman 950A	RFOA-0577-020	020	Monitor Labs or Lear Siegler 8841	RFNA-0991-083	083
Bendix 8002	RFOA-0176-007	007	Opsis AR 500, System 300 (open path)	EQNA-0495-102	102
Columbia Scientific Industries 2000	RFOA-0279-036	036	Philips PW9762/02	RFNA-0879-040	040
Dasibi 1003-AH, -PC, -RS	EQOA-0577-019	019	Thermo Electron or Thermo		
Dasibi 1008-AH, -PC, -RS	EQOA-0383-056	056	Environmental Instruments 14B/E	RFNA-0179-035	035
DKK Corp. Model GUX-113E	EQOA-0200-134	134	Thermo Electron or Thermo		
Envirotronics 300	EQOA-0990-078	078	Environmental Instruments 14D/E	RFNA-0279-037	037
Environnement S.A. O <sub>3</sub> 41M	EQOA-0895-105	105	Thermo Environmental Instr. 42, 42C	RFNA-1289-074	074
Environnement S.A. SANO A	EQOA-0400-137	137			
Horiba APOA-360	EQOA-0196-112	112	<b><u>Pb Manual Methods</u></b>		
Lear Siegler or Monitor Labs ML9810,			Reference method (hi-vol/AA spect.)	--	803
Monitor Labs ML9810B, Wedding 1010	EQOA-0193-091	091	Hi-vol/AA spect. (alt. extr.)	EQL-0380-043	043
McMillan 1100-1	RFOA-1076-014	514	Hi-vol/Energy-disp XRF (TX ACB)	EQL-0783-058	058
McMillan 1100-2	RFOA-1076-015	515	Hi-vol/Energy-disp XRF (NEA)	EQL-0589-072	072
McMillan 1100-3	RFOA-1076-016	016	Hi-vol/Flameless AA (EMSL/EPA)	EQL-0380-044	044
Meloy OA325-2R	RFOA-1075-003	003	Hi-vol/Flameless AA (Houston)	EQL-0895-107	107
Meloy OA350-2R	RFOA-1075-004	004	Hi-vol/Flameless AA (Omaha)	EQL-0785-059	059
Monitor Labs 8410E	RFOA-1176-017	017	Hi-vol/ICAP spect. (Doe Run Co.)	EQL-0196-113	113
Monitor Labs or Lear Siegler 8810	EQOA-0881-053	053	Hi-vol/ICAP spect. (EMSL/EPA)	EQL-0380-045	045
Opsis AR 500, System 300 (open path)	EQOA-0495-103	103	Hi-vol/ICAP spect. (Illinois)	EQL-1193-094	094
PCI Ozone Corp. LC-12	EQOA-0382-055	055	Hi-vol/ICAP spect. (Kansas)	EQL-0592-085	085
Philips PW9771	EQOA-0777-023	023	Hi-vol/ICAP spect. (Montana)	EQL-0483-057	057
Thermo Electron or Thermo			Hi-vol/ICAP spect. (NE&T)	EQL-1188-069	069
Environmental Instruments 49, 49C	EQOA-0880-047	047	Hi-vol/ICAP spect. (New Hampshire)	EQL-1290-080	080
			Hi-vol/ICAP spect. (Pennsylvania)	EQL-0592-086	086
<b><u>CO Analyzers</u></b>			Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-109	109
Advanced Pollution Instr. 300 or			Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-110	110
Teledyne Analytical Instruments GFC 7000			Hi-vol/ICAP spect. (Rhode Island)	EQL-0888-068	068
RFCA-1093-093	093		Hi-vol/ICAP spect. (Silver Val. Labs)	EQL-1288-070	070
Beckman 866	RFCA-0876-012	012	Hi-vol/ICAP spect. (West Virginia)	EQL-0694-096	096
Bendix 8501-5CA	RFCA-0276-008	008	Hi-vol/WL-disp. XRF (CA A&IHL)	EQL-0581-052	052



**PM<sub>10</sub> Samplers**

Andersen Instruments,RAAS10-100	RFPS-0699-130	130
Andersen Instruments,RAAS10-200	RFPS-0699-131	131
Andersen Instruments,RAAS10-300	RFPS-0699-132	132
BGI Model PQ100	RFPS-1298-124	124
BGI Model PQ200	RFPS-1298-125	125
Oregon DEQ Medium volume sampler	RFPS-0389-071	071
Rupprecht & Patashnick Partisol 2000	RFPS-0694-098	098
R & P Partisol-FRM Model 2000	RFPS-1298-126	126
R & P Partisol-Plus Model 2025 Seq.	RFPS-1298-127	127
Sierra-Andersen/GMW 1200	RFPS-1287-063	063
Sierra-Andersen/GMW 321-B	RFPS-1287-064	064
Sierra-Andersen/GMW 321-C	RFPS-1287-065	065
Sierra-Andersen/GMW 241 Dichot.	RFPS-0789-073	073
W&A/Thermo Electron Mod 600 HVL	RFPS-1087-062	062

**PM<sub>10</sub> Analyzers**

Andersen Instruments Beta FH62I-N	EQPM-0990-076	076
Met One BAM1020, GBAM1020, BAM1020-I, GBAM1020-I	EQPM-0798-122	122
R & P TEOM 1400, 1400a	EQPM-1090-079	079
W&A/Thermo Electron 650 Beta Gauge	EQPM-0391-081	081

**PM<sub>2.5</sub> Samplers**

Andersen Model RAAS2.5-200 Audit	RFPS-0299-128	128
BGI PQ200/200A	RFPS-0498-116	116
Graseby Andersen RAAS2.5-100	RFPS-0598-119	119
Graseby Andersen RAAS2.5-300	RFPS-0598-120	120
R & P Partisol-FRM 2000	RFPS-0498-117	117
R & P Partisol-Plus 2025	RFPS-0498-118	118
R & P Partisol 2000 Audit	RFPS-0499-129	129
Thermo Enviro Model 605 CAPS	RFPS-1098-123	123
URG-MASS100	RFPS-0400-135	135
URG-MASS300	RFPS-0400-136	136

**TSP Manual Method**

Reference method (high-volume)	--	802
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